Summary

On Biology and Ecology of North African Red Deer Cervus elaphus barbarus, 1833

Red deer population dynamics were studied in northern Africa for several months. Details of physiological rhythms and several aspects of behaviour are described and discussed. Some points are made about morphological peculiarities of the antlers.

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A Method for Determining the Composition, Deployment and Stability of Groups of Free-Ranging Dolphins

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Receipt of Ms. 27. 10. 1971

Accurate counts of the number and age-sex class composition of groups of free-ranging dolphins are hampered by limited conditions of water clarity and by the difficulty of identifying animals which inhabit a three-dimensional aquatic environment and which

Z. Säugetierkunde 37 (1972) 116—119

are only partially visible for brief periods when they rise intermittently to the surface to breathe. The group composition and spatial deployment of subgroups of age- and sex-classes are important measures of the socioecology of groups of free-ranging nonhuman primates (De Vore and Washburn 1963, Kummer 1968, Rowell 1969, Stoltz and Saayman 1970, Aldrich-Blake, Bunn, Dunbar and Headley 1971), and there is evidence that these indexes may also be important measures of the social organisation and behavior of delphinids (Evans and Bastian 1969, Tayler and Saayman, in press). We report here a photographic method for the more accurate determination of group structure and deployment in dolphins, devised during current systematic studies of free-ranging dolphins on the Eastern Cape Coast of South Africa.

A Minolta Super 8 D 10 ciné-camera, equipped with an intervalometer providing preset automatic shutter intervals of between 0.5 and 60.0 seconds, with a 7 to 70 mm. continuously variable lens, was set up at coastal vantage points to film dolphins, progressing in or just beyond the surf-zone, as they crossed the camera field. With the camera set to intervalometer operation at 0.5 second intervals, each dolphin was photographed at least twice as it surfaced for air when travelling at speed, and up to four times when progressing slowly, as the group of dolphins crossed the fixed field of view. Depending upon the topography of the coastline, the camera could be quickly moved by vehicle and set up at successive points further down the coast to obtain additional photographic records in the same manner.

The processed film was projected onto a movable 20 cm. wide paper roll screen, employing a projector for frame-by-frame analysis. The first frame was projected and any surfacing dolphins were marked on the screen. The second frame was projected and the screen was rolled on for a noted amount to correspond with the new position taken up by the same dolphins. This gave an index of the distance travelled by the animals in 0.5 seconds. The third frame was projected and the paper roll screen was again advanced by the same amount, thus ensuring that the dolphins, now submerging, had been accurately tracked by the movement of the screen. The screen was advanced in the direction of the progression, by this predetermined amount, for each successive frame projected, irrespective of whether new dolphins appeared or not. Each dolphin was marked once only when it became clearly discernible on the screen. When all the frames, which might total up to 60, had been projected and all of the dolphins had been marked, the total number of dolphins and their spatial deployment was available (Fig. 1). The distance over which the dolphins were dispersed was calculated, using

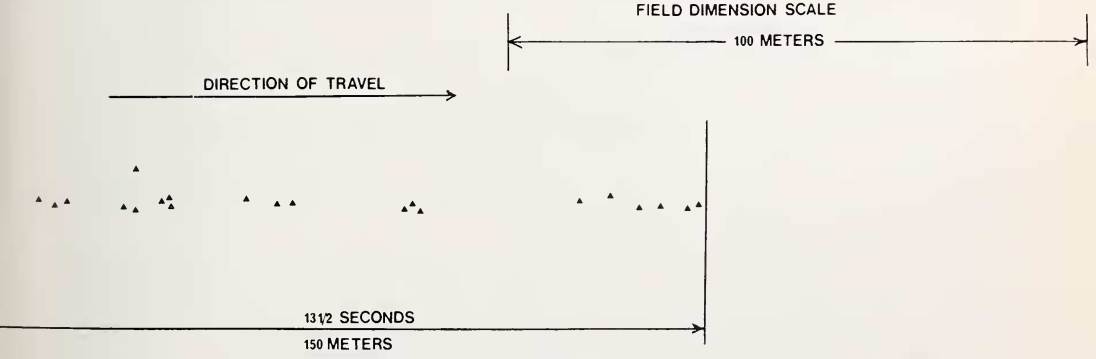

Fig. 1. The 22 points illustrate a progression of Indian Ocean bottlenose dolphins *(Tursiops aduncus),* dispersed over 150 m. in subgroups, with 2 lone individuals, along the surf-zone. The progression rate can be calculated, and the dolphins, although surfacing individually, are shown to be swimming in formation.

the estimated length of a dolphin (generally about 2.4 m. for the adult dolphin) as an approximate scale.

Observations of free-ranging bottlenose dolphins *(Tursiops aduncus)* from cliffs overlooking clear water, as well as of captive dolphins, indicate that dolphins, deployed in a vertical formation (in depth), or in line astern formation, generally surface individually: the animal accelerates to the surface, decelerates to the original formation speed and, after submerging, accelerates again to adopt its original position in the formation. Thus, the speed of the dolphin, when filmed at the surface, appears to reflect, fairly accurately, the rate of the underwater formation, which cannot be clearly perceived from low coastal vantage points.

Fig. 2. Two Indian Ocean bottlenose dolphins *(Tursiops aduncus)* surface simultaneously at speed. The dolphins on the left is completing a „long-jump", seen characteristically during fish herding procedures, or when a group of dolphins is progressing rapidly in transit from one area to another.

The total number of dolphins, as well as the deployment of subgroups, can be derived from the plotted progression. With fine grain black and white film, age classes can also be estimated by the size of the animals.

When counts without photographic aids are made, subgroups of two or more dolphins, surfacing simultaneously (see fig. 2), are readily identifiable. However, dolphins surfacing individually at widely at separated points may be mistaken for lone individuals: this photographic technique has frequently revealed that several dolphins, although surfacing individually for air at intermittent intervals, were in fact swimming in unison whilst deployed in cohesive subgroups on a vertical plane or in line astern formation.

Successive plots of the same group, made at intervals further along the coast, provide a check on the accuracy of counts, and, more importantly, show any variability in the deployment and composition of subgroups, thus providing an index of the stability of subgroup combinations in delphinid social organisation. Further, the speed of the whole progression can be determined from the known time interval *vs* distance and the progression rate thus obtainable provides a useful index of correlative maintenance activities and social behavior.

Although this method does not accurately reflect the width of the progression due to the low angle of inclination from which many records are obtained, it is nevertheless a useful technique in the study of swiftly moving marine mammals and provides a permanent record of events which is available for repeated examination.

This work was supported by grants from Messrs. John Haig and Company. We thank Mr. V. L. Connett for his assistance.

We thank Dr. David K. Caldwell and Dr. Melba C. Caldwell, University of Florida, for their critical reading of the manuscript.

Summary

Is is generally not possible to accurately determine the number, age-class composition and deployment of fastswimming groups of dolphins when animals appear only briefly to breathe at the surface. A photographic method, employing an intervalometer-controlled ciné-camera, a modified projector for frame-by-frame analysis and the plotting of single frames on a movable paper screen, was devised for the more accurate determination of group structure and deployment of free-ranging dolphins on the Eastern Cape Coast of South Africa. The method permits the plotting of the whole progression of a group of dolphins on a time-distance scale, from which the number, deployment of individuals and the relative ageclass composition can be extracted.

Zusammenfassung

Wegen der kurzen Atempause an der Wasseroberfläche ist es im allgemeinen nicht möglich, genau die Zahl, Alter und Verbreitung von schnell-schwimmenden Delphinen festzustellen. Daher mußte eine spezielle Methode entwickelt werden mit einer intervalometer-kontrollierten Cine-Kamera. Diese ist ein angepaßter Projektor mit individuellen Dia-Analysen, welche auf einen beweglichen Papierschirm projiziert. Damit kann eine genauere Feststellung der Gruppenstruktur und die Verbreitung von frei lebenden Delphinen an der östlichen Küste von Südafrika determiniert werden. Diese Methode ermöglicht eine Analyse der Bewegung einer Delphinengruppe auf der Grundlage einer Zeit-Distanz-Skala. Von dieser kann die Anzahl, Verbreitung von Individuen und die relative Altersgruppen-Komposition abgeleitet werden.

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